FAA
general aviation NEWS
JULY-AUGUST 1979
A DOT / FAA FLIGHT STANDARDS SAFETY PUBLICATION

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FAA GENERAL AVIATION NEWS

**DEPARTMENT OF TRANSPORTATION/
FEDERAL AVIATION ADMINISTRATION**

JULY-AUGUST 1979

VOL. 18, NO. 4

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FAA GENERAL AVIATION NEWS is published by Flight Standards Service, Federal Aviation Administration, Department of Transportation, Washington, D.C. 20591, in the interest of flight safety. The magazine is designed to promote safety in the air by calling the attention of general aviation airmen to current technical, regulatory and procedural matters affecting the safe operation of aircraft. Use of funds for printing FAA GENERAL AVIATION NEWS was approved by the Office of Management and Budget through August 31, 1980. All printed materials contained herein are advisory or informational in nature and should not be construed as having regulatory effect. The FAA does not officially endorse any goods, services, materials or products of manufacturers that may be mentioned. Certain details of accidents described herein are altered to protect the privacy of those involved.

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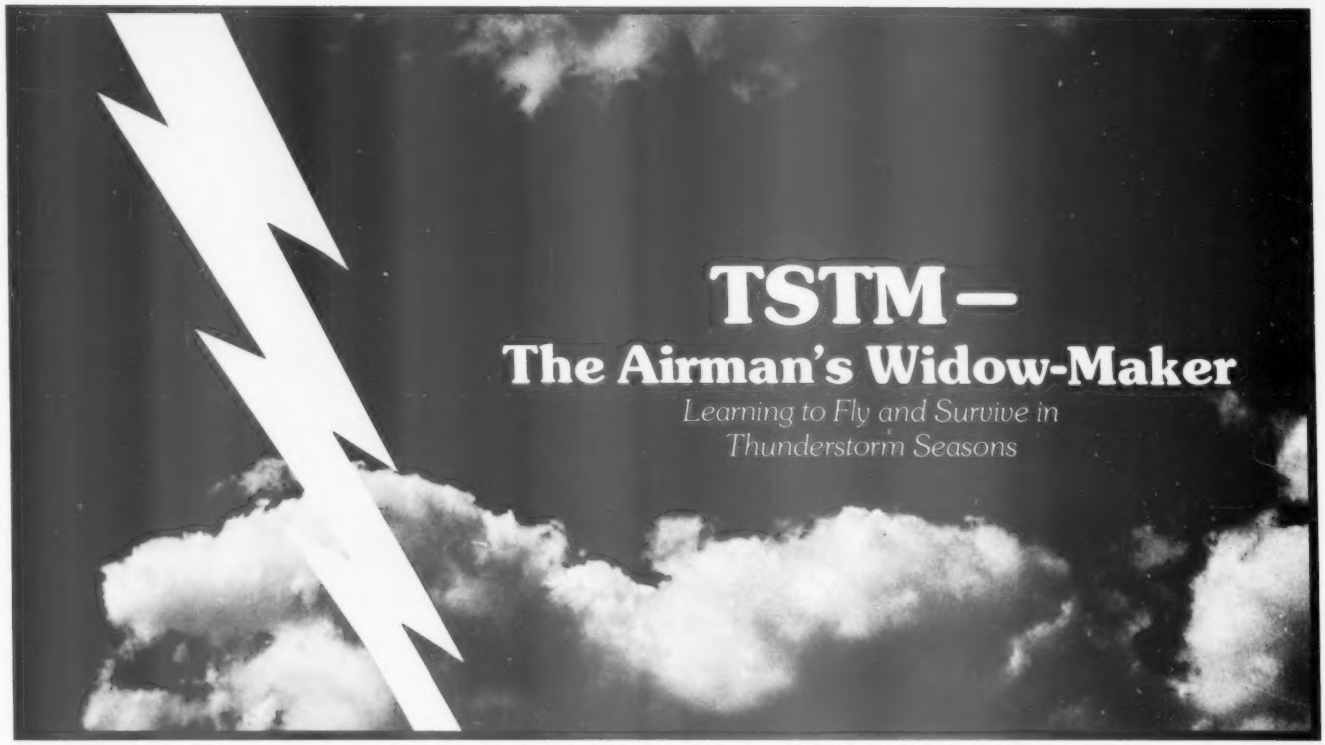
TAIL CONE CORROSION. Recent reports of corrosion in the tail cone areas of various models of single engine Cessna aircraft have blamed the problem on lithium sulfur batteries, which leaked. (An airworthiness directive in March ordered immediate removal of such batteries, after they had been found responsible for various kinds of damage, including corrosion of control cables.) If any indications of corrosion are observed, they should be brought to the attention of a certified mechanic.

ELT FAILURES, incidentally, are not always due to mechanical breakdowns. In some cases the emegency locator transmitter failed to go off, following a crash, because a shipping screw which locks the unit in the "disarm" mode had not been removed during installation. Such locking screws are usually tagged prominently by the manufacturer or shipper, but occasionally ignored--especially when the ELT is simply carried on board as a portable unit.

INSTRUMENT EXAMS. A recent Flight Standards change order enables a pilot being flight tested for an instrument rating to carry out two of the required three instrument approaches in a flight simulator--at the discretion of the inspector or examiner.

SURVIVAL OR ANTI-SURVIVAL? A near-fatal accident occurred earlier this year at Pearl Harbor, Hawaii, when a signal flare ignited in the cockpit in flight. A student was taking instruction in touch-and-go landings in a Cessna 152 when the glove compartment door opened and a signal flare, kept on board as part of the survival gear, slid out and ignited. The instructor took over the airplane, as the cockpit was enveloped in smoke and flames, made a steep 180° turn and landed quick and hard--but safely. He escaped with second and third degree burns; the student had only minor injuries, but the airplane was destroyed by fire. Because of the unstable nature of such flares they should always be secured firmly in the aircraft before takeoff.

BLADDER BRUISING. Bladder type fuel cells, now common in general aviation, can be damaged during fueling if the hose nozzles are handled carelessly. If the nozzle scrapes against the interior wall, or bruises the bottom of the cell, the thin, soft material could develop a leak. No need to point out how serious a hazard this could be. Careless handling of fuel nozzles should be reported to the fixed base operator.



TSTM—
The Airman's Widow-Maker

Learning to Fly and Survive in Thunderstorm Seasons

TSTM, a weatherman's term for a thunderstorm, is close to the initials for high powered explosives and perhaps this is more than coincidence. The energy developed during the upward thrust of a thunderstorm is often greater than that required to blast off a rocket to the moon. Every type of aircraft, from small trainers to huge transports, is vulnerable to structural damage from the turbulence and hail of a thunderstorm. The catastrophic crash of the Southern Airways DC-9 in Georgia in 1977, for example, following penetration of a severe thunderstorm cell, was preceded by a deluge of hail stones that broke through the cockpit windshield. A few minutes later both jet engines flamed out as a consequence of massive water intake, and could not be restarted before the aircraft crashed on a highway, killing 62 persons on board and nine persons on the ground.

As a result of flying in thunderstorms, wings have been wrenched off, control surfaces have been bent out of shape, windows have been shattered, and radios silenced. In addition, the violent up and down drafts and frequent icing encountered in thunderstorms have often led to loss of control and destruction of the aircraft. An average of 45-50 accidents every year, more than half of them fatal, are attributed to thunderstorm activity, according to the National Transportation Safety Board.

Obviously such weather is something for pilots to avoid—no argument on this point. The problem is that thunderstorms are most prevalent in the United States during the three summer months when general aviation pilots like best to fly. At any point within a great central region of the United States, from the Canadian border to Texas and from the Rockies to the eastern seaboard (with the exception of northeast), a thunderstorm will occur on the average of at least *once every three days during June, July and August*. The frequency of thunderstorm occurrences is even greater in some portions of the Rockies (four days out of nine) and in the Florida peninsula (four to five days out of nine).

So, if you want to fly in the summertime but avoid thunderstorms, and do not happen to live in an area of minimal TSTM activity, what can you do?

You can start by learning how to "read" clouds with some degree of confidence. Despite the abundance of literature on cloud formation, with their dozens of identifiable shapes and esoteric Latin names, most pilots can do little more than make an uneducated guess about the clouds they encounter en route—and in fact many cloud formations are combined forms. It is not really necessary to know all their names. What matters most, from the point of view of watching out for thunderstorms, is whether the clouds you see are essentially horizontal (stratiform); or whether they are bunched up (cumulous); and most importantly of all, whether there is a distinct vertical buildup.

A thunderstorm is an ice and rainmaking device. It is set in motion by an initial upward boost of warm air. As this air reaches a cooler environment, its water vapor may condense and form a cumulous cloud. Condensation releases latent heat, which drives the updraft still faster, draws more water vapor into the cloud, releases more heat and accelerates the upward thrust—which may eventually exceed 6,000 feet per minute. The cloud itself may have a vertical growth rate of more than 3,000 feet per minute. This is discouraging to the pilot of a light aircraft who attempts to outclimb it.

Eventually the condensed moisture which is carried aloft coalesces into raindrops (or ice or snow), the upward movement is slowed to a halt, and precipitation begins to fall. This creates a downdraft of cool air, often in close proximity to the warm updraft. The downrushing air spreads outward at the surface, producing strong, gusty surface winds, a sharp temperature drop, and a rapid rise in pressure. The surface wind surge is called a "plow wind," and its leading edge (which may be 10 or 15 miles beyond the storm cloud) is called the "first gust," or "gust front." Such clear air gusts are hazards to aircraft operating at nearby airports even when the airport itself is well clear of the clouds. Large air carriers have crashed attempting to land in the face of approaching storms.

Downdrafts cool off the nearby updrafts and cause the storm to die away. However, storms may consist of many "cells" of up and down drafts, whose life cycles are proceeding at different paces; the storm is dangerous to aircraft as long as any of its cells are still in the active stage.

The original updraft may be caused by solar heating of the earth within a relatively uniform *air mass*, resulting in a convectional upflow that is fairly perpendicular. Or the upward thrust may

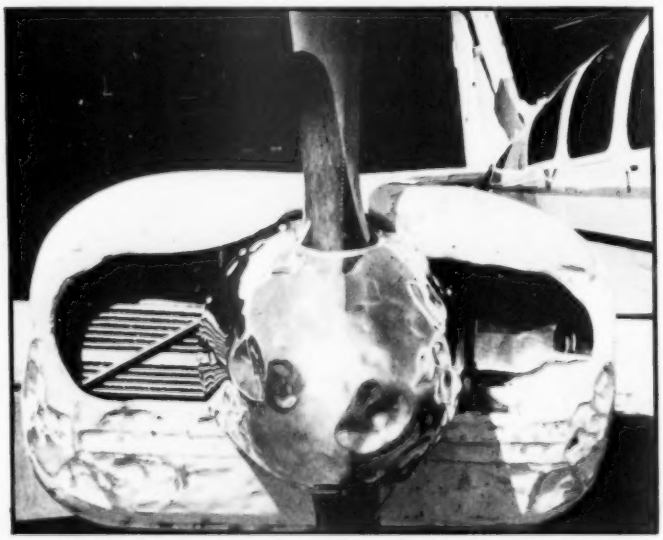
Countoured Areas Show Average Number of Thunderstorms June—July—August

Enroute Flight Advisory Service (EFAS) "Flight Watch"

originate within a moving body of warm air as it is confronted by a body of cooler air and is forced up over it. Thunderstorms associated with these frontal systems are usually larger and more concentrated than *air mass* TSTMs. They will measure up to 30 miles in diameter at the base, which may be located only a few hundred feet above the earth (in moist environment) or may be over 10,000 feet. Cloud tops generally range from 25,000 to 45,000 feet, but may be even higher.

Frontal thunderstorms also form more slowly than air mass or convectional types, since the upward flow of air is not straight up; but once formed, the frontal TSTMs cool off slower and are much longer lived, as some of the precipitation may fall outside of the storm cloud. Several such storms may be imbedded in the stratiform clouds associated with a front. These storm clouds are difficult for a pilot to identify, once he penetrates the frontal clouds. Fortunately, the presence and movement of large frontal thunderstorms can be forecast with considerable accuracy by the Weather Service. Pilots who take pains to be thoroughly briefed on the weather, prior to departure, can usually stay clear of them.

Air mass or convection thunderstorms, which can be born and die away within an hour, require more active vigilance on the part of the pilot. They originate as puffy white cumulous "fair-weather" clouds, polka-dotting an otherwise clear blue sky, and there is no way of predicting which of these innocent-looking clouds is going to be transformed suddenly into a meteorological monster. Pilots who have inadvertently flown through thunderstorms—and survived—have the habit of keeping all cumulous clouds under constant surveillance. They become suspicious of any rapid vertical growth. They know that when you are air-borne, thunderstorm clouds do not always present the classic profile you see in pictures of them. Most experienced IFR-rated pilots will admit to having been surprised on more than one occasion by the severity of turbulence encountered after penetrating such "puff-balls." Nearly half of the accidents involving structural failure caused by cloud turbulence occur to instrument-rated pilots.



Consequences of golf-ball sized hail encountered in a storm.

An accident which occurred in the midwest last June is a sobering example of how rapidly thunderstorms can move in, and how overconfidence in one's ability to analyze clouds can lead to fatal error.

The aircraft invoived was a Cessna *Cardinal,* a single engine retractable. The pilot, Dwight Harrison, 31, held a commercial certificate with instrument rating and had logged 872 hours, 98 in type. He was an insurance broker at Kansas City, Mo., specializing in aviation insurance, and used his aircraft for some of his business activities. The *Cardinal* had been flown early that month to Springfield, Mo., to have maintenance work performed on the landing gear. On the day of the accident the pilot flew from Kansas City to Springfield in a Cessna twin 340 owned by a friend, Harry Samuels. The 140 mile flight to Springfield took approximately 40 minutes, with touchdown at Springfield Municipal Airport logged at 2:16 p.m. local time. After landing the two pilots parted company, preparing to fly back in separate aircraft.

According to the air traffic control tower at Springfield, Harrison's *Cardinal* departed at 2:35 p.m. on an instrument flight plan for Kansas City. The pilot had requested and been assigned an en route altitude of 6,000 feet. The FSS at Springfield had no record of any weather briefing being given to Harrison.

The area forecast for western Missouri, issued at 8:00 a.m. and valid for 18 hours, called for ". . . significant clouds and weather; ceiling 2,000 feet broken variable to scattered, 8,000 feet broken; visibility 3 miles; moderate rain showers and thunderstorms, tops 22,000 to 45,000 feet."

The surface observations for Kansas City at 2:46 p.m. reported conditions essentially as forecast. The radar weather observation showed the terminal area 5/10 covered by strong echoes, indicating thunderstorms producing rain showers of increasing intensity, moving in an easterly direction at 12 knots.

At 2:41 p.m. the *Cardinal* pilot reported to Springfield departure control that he was level at 6,000. This was his requested en route altitude. He was advised to contact Kansas City center. Radar contact was established at 2:45.

At 11:55 a.m. a convective SIGMET was broadcast over VOR transmitters in the central United States, warning that a line of severe thunderstorms had developed over the central Mississippi Valley and was moving eastward at 20 knots.

At 3:11 p.m. radar and radio contact with the *Cardinal* was lost. One minute later contact was re-established briefly, then lost again. There was no further contact between the aircraft and the air traffic control service.

At 3:30 p.m. police at Clinton, Mo., received a telephone call from a farmer who said that he thought he had seen an aircraft wing falling into one of his fields. He said that it was raining heavily, with loud thunder and lightning, and strong wind gusts that tore shingles off his barn. An emergency unit sent out to the farm located the fuselage of the wrecked *Cardinal*, which had in fact separated from the wing in flight. The body in the cockpit was identified as Harrison.

The subsequent investigation by the National Transportation Safety Board attributed the accident to structural disintegration, following penetration of a severe thunderstorm.

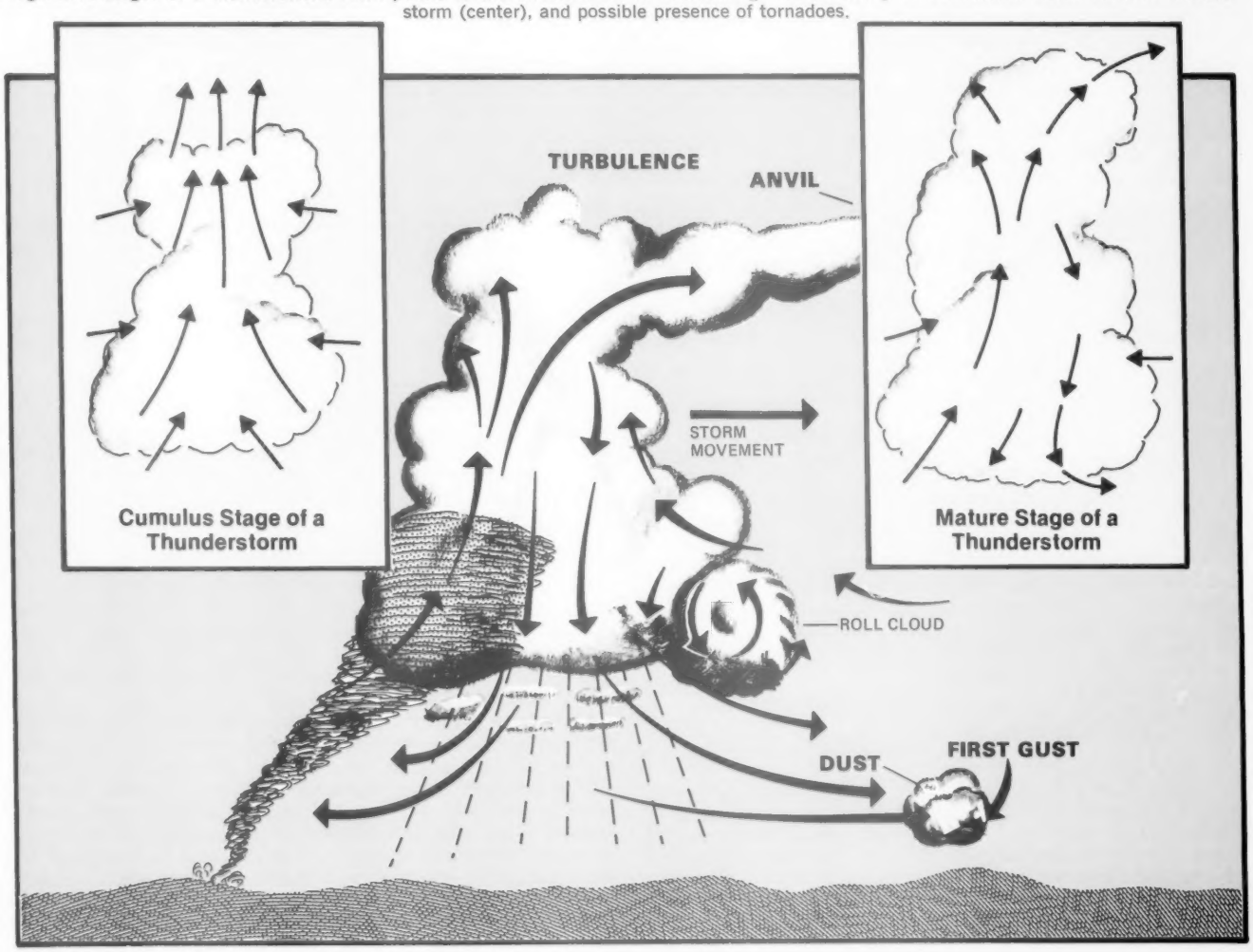
Samuels, the pilot and owner of the 340 twin, who had flown down to Springfield with Harrison, gave this statement:

"Dwight was a good pilot. He got the weather briefing himself at K.C. because he was going to do the flying—he wanted to build up his multi-engine time. It wasn't really too bad once we got up to altitude. Lot of cumulus stuff, but nothing that looked like heavy weather. We went around a few clouds that showed some returns on my weather radar, but mostly we went through them. Dwight was pretty confident about being able to pick his way on his own judgment. He didn't have radar on his own plane, but he liked to say he had radar eyes. We hit a few nasty bumps and some rain, but that was all.

"At Springfield he went right over to his airplane and I didn't see him again. I was kind of surprised he didn't come up to the FSS to check on the weather, but then we'd just flown over the route and I guess he figured he knew what to expect. I know he had some business to take care of back in K.C. in the afternoon.

"I started back about three o'clock, soon as I got my IFR clearance. I filed for 12,000 feet. Generally I find if you hit some bad stuff, it's worse at lower altitudes, and I'd seen that convective SIGMET they put out at the FSS. About 40 miles out of Springfield I didn't like what I saw on the radar and I asked to be vectored off to the west. So I came into K.C. by way of Butler and Lawrence, and didn't have too much trouble, though I was kinda busy during the letdown and approach. While K.C. approach control was working me I asked them if Dwight had pulled in, and they said no. I tried calling him on 123.9, but no soap. I called the tower after I got on

Progressive stages of a thunderstorm. Anvil points to the direction storm is traveling. Note severity of downdrafts under base of mature storm (center), and possible presence of tornadoes.



Cumulous clouds over mountain (left) have begun vertical buildup into possible thunderstorm in second photo, taken three minutes later.

the ground and they still hadn't heard."

Area forecasts are generally correct, but in the 12 hours that elapse between forecasts the weather picture can change radically, especially in the thunderstorm season. Pilots should supplement their information with surface reports, not only for their destination airport but for all the reporting stations en route. Check the FSS also for SIGMETS and AIRMETS which indicate worsening weather; these may be picked up inflight by a voiced broadcast over the VOR at 15 minute intervals on the hour, or on an unscheduled basis upon receipt. Convectional SIGMETS are broadcast 55 minutes past the hour. Check in often with Flight Watch (the special en route weather advisory service on 122.0).

Picking your way across the sky in between thunderstorms is a difficult and often risky business, especially if you do not have weather radar on the airplane. In general it is up to you as the pilot to ask for vectors around a storm in a given direction. Do not assume that the controller is in a better position to see the weather, because that is not always the case. Airborne weather radar can often give you a better picture of what lies ahead than ground radar, which is primarily designed to separate air traffic.

Remember too, that radar echoes merely show *precipitation* intensity, not turbulence. Updrafts, which may be without precipitation in a maturing storm, move much more violently than downdrafts. You want to give the area of strong radar returns a wide berth. There is no sure way to pick out "soft spots" between cells.

The intended use of airborne radar is for avoiding thunderstorms, not for finding openings between active cells. The equipment is just not that precise. The weather "picture" portrayed on the scope is not obvious; radar returns must be interpreted in the light of experience and current knowledge of associated conditions. Even experienced air carrier pilots can misinterpret echoes when the radome is immersed in moisture. Quite commonly, TSTM turbulence may extend as far as 20 miles from the edge of an intense radar echo. A device known as Ryan stormscope does measure turbulence directly but this device too is intended to help the pilot *avoid* storms, not penetrate them.

Squall lines are lines of thunderstorms strung out across the countryside, sometimes extending over a hundred miles. These are the most intense thunderstorms imaginable, and are usually linked too closely together to be penetrated safely. The line may be too long to be circumnavigated practically (without running out of fuel). Squall lines usually appear in the late afternoon and last until darkness or longer.

Tornadoes form as appendages of violent thunderstorms, when the updrafts create a rotating motion at the cloud base. A funnel-shaped cloud extends downward from the base with an extremely concentrated vortex that sucks up dust and debris and even buildings. Tornado winds have been estimated as high as 200 mph. (If the funnel cloud touches down on land, it is called a tornado, if on water, it is a waterspout.) Any cloud lurking near the base of a thunderstorm could contain such a vortex.

In sum: *no one should ever intentionally attempt to fly through, under or over a thunderstorm.* Overflight might be possible with jet aircraft, but only when the cloud tops are *known* to be several thousand feet below the service ceiling. Thunderstorms imbedded in frontal systems or extended as squall lines are usually forecast or reported with sufficient advance warning to be avoided or waited out on the ground. Convection type thunderstorms are usually scattered widely enough to pass between; however, lateral separation from a severe TSTM should be at least 15-20 miles. Clouds with a pronounced vertical buildup should not be penerated without onboard radar. ■

Ask the Weatherman

Q. Isn't there a formula I can use to estimate the altitude of a thunderstorm base?

A. If you know the spread between the surface temperature and the dewpoint, you can divide this figure by four and get the approximate height about the surface of the cloud base (in thousands of feet). However, most thunderstorm bases are too close to the ground to be flown under without experiencing severe turbulence. Remember, there may be trailing tornadoes as well.

Q. If I get caught in a thunderstorm, is there danger of carburetor icing?

A. Definitely. Turn on full carburetor and pilot tube heat immediately.

Q. Should you go to full if you caught in a downdraft?

A. No, use the power setting for turbulence penetration speed recommended in your owner's manual. Full power is more likely to overstress the airplane.

Q. How about the automatic pilot?

A. Disengage, for the same reason.

Q. If I get caught in a thunderstorm, should I push on through, turn back, try to climb, or descend?

A. None of the above. If you really penetrate a cell, you will have your hands full and feet busy just trying to keep some semblance of altitude control. Don't fight the air currents, go with the flow and keep as nearly straight and level as you can. If you are lucky you will break out with enough altitude to recover. Downdrafts always flare out near the surface, and you want to be right side up when that happens.

'O Say, Can You See?"

A semi-annual pilot inspection of the cabin should not overlook the windows

One area that is frequently overlooked by the pilot or owner of a general aviation aircraft, in between annual inspections, is the immediate environment of the pilot: the cockpit or cabin. Material changes taking place right under your nose or within your grasp often pass unnoticed, despite their obvious importance. Consider, for example, the plastic windshield and windows that give you your outside visibility, upon which your survival depends.

Just how well can you see out of it? Disregarding, for the moment, bug or mud spatterings, are you getting unobstructed vision, or are you getting a noticeably reduced light level (through non-tinted windows)? Are you getting excessive glare, or reflections that distort outlook? Are you aware of having to strain your eyes somewhat to make out objects ahead or to the side?

Some pilots have the impression that all plastic windows are restrictive to vision, but that is not true of modern aircraft. The contemporary material is Plexiglas, an acrylic plastic which in good condition is more transparent than clear glass, admitting over 90 percent of the available visible light.

The acrylic used on aircraft is a remarkably strong and versatile material. It weighs much less than glass, is more readily molded to form the windshield, and it has a far greater impact resistance.

For most light aircraft, the acrylic plastic windows are made up of a single polymer layer, which means there is no lamination that can separate. The material is designed to absorb much of the ultraviolet light that could produce painful burns at altitude. It withstands radical changes in temperature remarkably well, and will endure years of outdoor exposure before it begins to show signs of discoloring or other deterioration.

If this type of acrylic has one weakness, it is *lack of hardness.* It scratches easily. Rubbing it with a coarse or unclean cloth, or even with a clean paper towel made up of coarse fibers, may produce minute scratches, which cause distracting reflections, or severe glare at certain sun angles.

To prolong its life and clarity, Plexiglas must be handled with "kid gloves." The outside surfaces should be washed down with water, to soak and soften the deposits and dirt coating, before any attempt is made to remove them by hand. A mild soap and water is the best combination for cleansing, plus very gentle pressure with very soft absorbent material. Chemical cleaners are best avoided, since some of them will react harmfully with Plexiglas. It is a temptation to go after bug spatterings with a solvent or coarse "scratch pads," but the safest procedure is persistent, gentle wiping with soap and warm water. If you rub with your bare hands, watch out for rings, diamond or otherwise.

The inside surface also needs occasional cleaning and the same procedure is followed —wet down and clean gently. Keeping the overall cockpit clean cuts down on dust accumulation on the windows.

If your windows are marred with small cuts or gouges, visibility may be improved by rubbing with a light abrasive. Such work should only be performed by a pilot who understands acrylics, or by a certificated airframe mechanic. The conditions can easily be worsened by improper methods.

Sooner or later age, usage, and environmental stress take their toll, and your Plexiglas begins a process of discloration, usually beginning with a milky appearance. "Crazing"—formation of myriads of tiny separation cracks—is another symptom of waning vitality. Fatigue cracks around fittings eventually develop, and could lead to loss of a windshield in flight, if ignored. Canadian aviation authorities recently reported an incident involving a pressurized twin engine aircraft which experienced a blowout of the righthand pilot's window at 20,000 feet. A passenger who was sitting there was partially sucked out through the opening, but fortunately his seat belt was fastened and he was pulled back inside, in a semi-conscious condition. Investigation disclosed crazing and other evidence of material fatigue in the window remnants.

Pilots sometimes pride themselves in their ability to adapt to diminishing visibility through their windshield and windows, when in fact what they are doing is tolerating an unsafe condition. Try comparing the visibility through your windshield with what you see when looking through a fresh sheet of Plexiglas or window glass, and you will get some idea of what you are missing.

The value of using external covers over plastic windows is questionable. In conditions of strong or gusty winds. it is very difficult to prevent the covers from flapping against the windows and causing abrasive damage, especially when any form of dust is present—which is nearly always the case. If you are concerned about preventing overheating in the cockpit, you can use *interior* protective shields fastened by Velcro around the windows. Commercial products of this type are available, using reflective "space blanket" material, or you can make your own readily demountable custom shades without much difficulty. They are a blessing to the pilot who has to climb into the cockpit in the heat of the day and tries to complete his preflight check before his bodily fluids are boiled away.

Perhaps the greatest source of harm to aircraft windows is the well meaning but uninformed individual who obligingly cleans your windows for you with some variety of chemical preparation soaked in a grimy rag and applied with much muscular exertion. Even airport employees are occasionally guilty of such malfeasance. Do not let anyone go near your windows with anything but a perfectly clean soft cloth or very soft paper towel, water (lukewarm) and soap.

Even if it means doing it yourself. ■

Appalachian Scud Running

Techniques and traps of flying in the eastern mountains, Part I

On a mild October afternoon the pilot of a Piper *Seneca* reported to Approach Control at the Asheville (N.C.) control tower that he was leaving seven thousand feet for nine thousand. The light twin was operating as an air taxi, transferring a patient from Greenville, S.C., to Philadelphia. In addition to the pilot and patient, there was a nurse on board and another passenger. On takeoff from Greenville the pilot had declined an intersection departure, stating he was "kind of heavy." He was on an IFR flight plan that would take him over the Appalachian mountains north of Asheville, on Victor airway 35, at an altitude of 9,000 feet. The tallest peak in the area was Mt. Mitchell, at 6,684′ the highest point east of the Rocky mountains. The *Seneca* was flying over an overcast, in an area where recent pilot reports had indicated moderate to severe turbulence.

Shortly before 2:00 p.m. the aircraft was handed off to the Atlanta en route air traffic control center. Radar contact indicated the *Seneca* was about 20 miles northeast of Asheville, flying at 9,000 feet over a valley that borders the Black Mountains, a massive ridge line which culminates in Mt. Mitchell at the southern end.

The flight proceeded in a routine manner until the center received a call from the pilot that he had dropped to 8,000 feet in a downdraft and was continuing to descend. Adjacent airspace was cleared by Air Traffic for the pilot to divert in any direction. A few moments later he radioed that he was at 6,700 feet and descending at a rate of 1,000 feet per minute. Snow was falling and he could not see the ground. At 2:00 p.m. radar and radio contact were lost; a search was initiated. The wrecked aircraft was eventually located by ground search parties on the side of Mt. Mitchell at the 5,500 foot level. There were no survivors.

The investigation of this accident by the National Transportation Safety Board, cited "Continued flight into known areas of severe turbulence" as the probable cause, noting that the pilot had been given inflight reports of such turbulence during his weather briefing, prior to departure from Greenville.

Severe downdrafts which can pluck an aircraft out of the sky from altitudes several thousand feet above the surface are one of the unsuspected phenomena of the Appalachians which have accounted for numerous aircraft accidents, and many fatalities. Pilots who originate from distant localities find it hard to believe that these "hills" are capable of breeding weather violence. They lack the dramatic profiles of the Rockies or the Sierras.

In comparison with the towering ranges of the western states, the Appalachian Mountains are, in fact, a fairly mild eruption of terrain, seldom more than a mile high, but they do constitute the longest continuous range in the United States (over 2,000 miles from Maine to Georgia, along the Appalachian crestline trail). As they did from the earliest days of the Republic, these mountains still pose a hazard to travelers to and from the eastern seaboard—especially to the general aviation VFR pilot. Approximately 30 accidents each year (almost half of them fatal) involving some aspect of mountain flying occur in the Appalachians. In the early days of airmail flying, when pilots tried to maintain a daily service without instruments for navigating in clouds, the central Appalachians earned a notorious reputation as the "graveyard of aviation."

The highest elevations of the Appalachians are found along the southeastern flank, in the Smokey Mountains of Tennessee and North Carolina, and the Blue Ridge Mountains of northern Georgia, North Carolina, and Virginia. The second highest ranges are the Green Mountains of Vermont and the White Mountains of New Hampshire and Maine. The western flank of the south and central Appalachians is made up primarily of a series of extensive ridges, usually not exceeding 4,000 feet in elevation, and an elevated plateau covering much of Tennessee, Kentucky, West Virginia, western Maryland, central Pennsylvania, and the southern tip of Ohio (see page 10).

For the early pioneers of the middle Atlantic states, the southern Appalachians—extending 750 miles as the crow flies from

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Georgia to Pennsylvania—proved a vexing barrier to westward expansion. The persistant continuity of sharp ridges and the absence of natural passes turned back settlers' wagons again and again. In 1750 the Cumberland Gap in southwestern Virginia opened up one passageway to the west, as pioneers followed Daniel Boone over Indian and buffalo trails into Kentucky. But many wagon trains of German and Scottish immigrant families never found their way through to the western lands and settled down in numerous small valleys and mountain "coves" of the Blue Ridge Mountains, to carry on a traditional way of life unaffected by outside contact until the 20th century.

This scarcity of clearly identifiable passes is one reason why the southern Appalachians, in particular, are so troublesome today for pilots of light aircraft. Although they contain some of the oldest rock formations in the world (perhaps a billion years old) many of the ranges have retained the sharp profile of their ridgeline, extending for miles without a significant break. Consisting largely of upraised layers of sedimentary rock, their basic thrust is north-northeasterly, and this is the natural direction of traffic flow. Motorists can drive along the Blue Ridge Parkway for 469 miles, from Front Royal, Va., to the Smokey Mountains, without ever leaving a mountain crest or ridge.

Because the crestline is often only a few thousand feet above sea level, visiting pilots are likely to assume they can transit these mountains VFR even when there are clouds in the area, expecting to be able to slip under the cloud base or maneuver in the clear through valleys. Even IFR-qualified pilots are frequently guilty of this dangerous type of "scud-running" close to the surface (often with loss of radio contact), disdaining the safety of the IFR airways. The result has been a heavy clustering of accidents involving flight directly into a mountainside, with a high percentage of fatalities.

The heaviest clustering of accidents in the Appalachians is found in the Southern Highlands, which includes the Blue Ridge Mountains of North Carolina and Georgia, and the Smokey Mountains of North Carolina and Tennessee. There were 24 mountain flying accidents in this area during the period from January 1, 1975, to July 1, 1978, and 14 of these were fatal accidents. Loss of life was high; frequently there were no survivors.

The highest elevations of the Blue Ridge Mountains are in North Carolina. The so-called "Asheville Basin"—a ring of mountains surrounding this western North Carolina city—has over 200 peaks above 5,000′ within a radius of approximately 40 miles.

That is enough elevation to make scud-running a very dangerous habit. But altitude alone is not the only factor. Climate is another. The Southern Highlands have an average rainfall of about 90 inches, the wettest climate of the eastern United States. Mist, fog, clouds, rain and snow are frequently encountered.

Additionally, these mountains are favored with a rich layer of topsoil which makes for lush vegetative growth—one of the reasons that 18th century farming pioneers settled down in the valleys. The forests are extremely dense, and even the open "balds" or heaths are covered by luxuriant stands of shrubs, including mountain laurel and gigantic rhododendrons.

This combination of thick vegetation and abundant rainfall provides the area with the moisture necessary for virtually instant cloud formation. In the morning, on the western side of the mountains the sky may be clear as a bell and offer an apparently easy VFR flight to the pilot approaching from the west. However, as the day progresses and the prevailing westerly winds push up the slopes, absorbing moisture from the dew-soaked woods and bush, the stage is set for possible rapid development of cumulous clouds and perhaps even a quick thunderstorm or two. There are no weather reporting stations at high elevations in the Southern Highlands, so the transitting pilot must supplement his weather briefing with the latest PIREPs before he starts, and keep a vigilant eye out for sudden changes in weather.

A sobering example of how such changes can affect a flight occurred on a May afternoon when a Cessna *Skylane* approached the Asheville Basin from the north. The pilot, who had 500 hours of flight time and was not instrument rated, had taken off alone from Seven Springs, Pa., at 11:40 that morning. His VFR flight plan indicated his destination was Panama City, Fla., with a planned fuel stop at Asheville. The area forecast issued at 8:40 a.m. did not call for obscuration of the mountains. The weather observation at Asheville issued at 12:55 p.m. reported VFR conditions, with scattered clouds at 6,000′, broken ceiling at 9,000′.

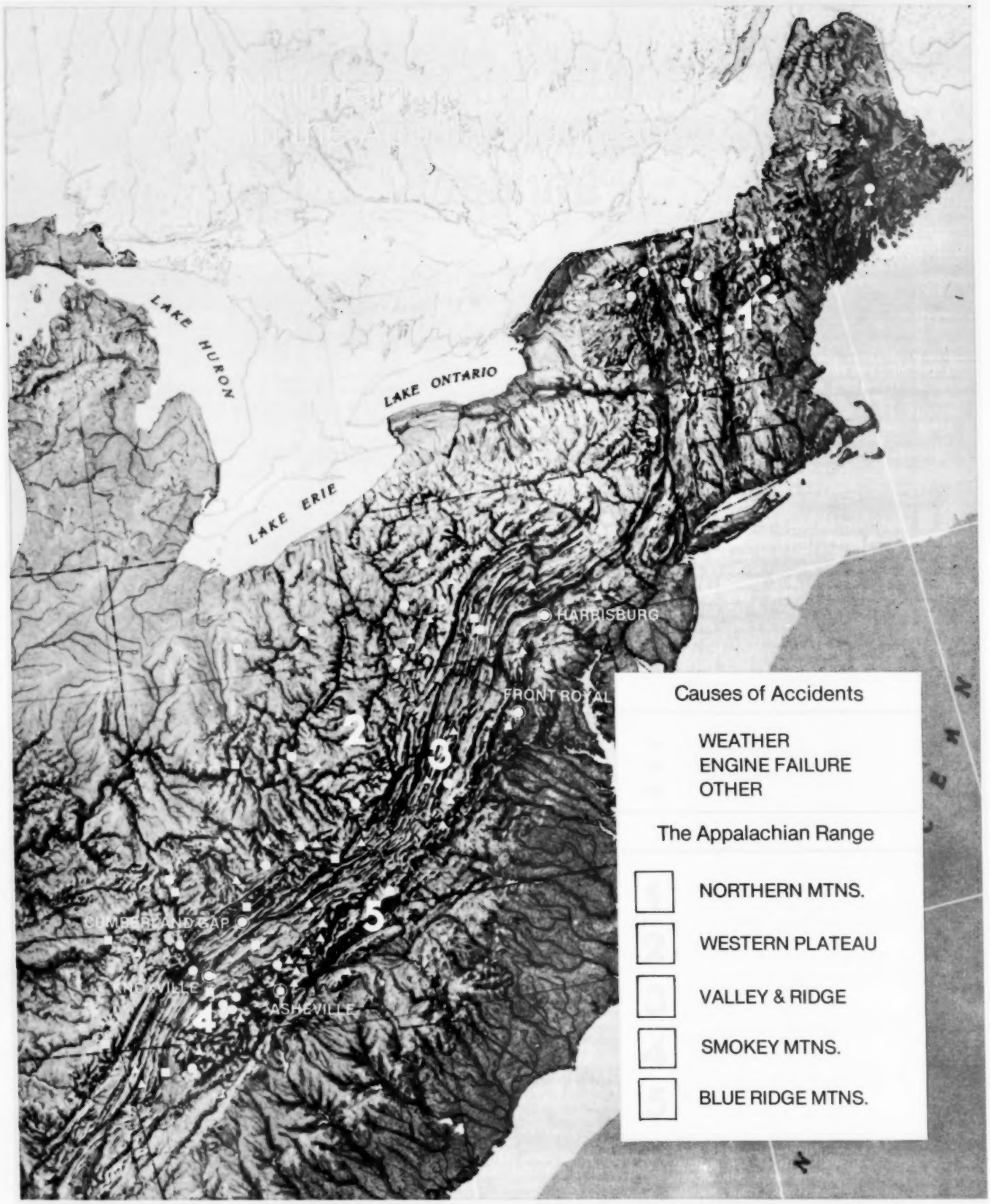
When the pilot failed to arrive at Asheville a search was organized and the aircraft wreckage was located at the 5,900 foot level of Grandfather Mountain (6,051′), a peak known for frequent high wind velocity and turbulence, approximately 55 miles north of the city—the pilot was dead. Witnesses reported the mountain tops were obscured and there was light rain at the time of the crash. The pilot apparently was navigating by means of an ADF tuned to a non-directional beacon frequency, and by visual reference. There were no sectional charts for this area in the aircraft.

The hazard of colliding with a mountainside is not the only danger associated with low-lying clouds. In the late fall, winter and early spring, icing in clouds is common at relatively low levels. In February of this year, a recently certificated pilot in a Piper *Tri-Pacer* took off from Jonesville, Ga., on a VFR flight to Knoxville. His flight path took him directly over the Smokey Mountains in the vicinity of Clingman's Dome, second highest peak in the Appalachians (6,642′). The lowering clouds iced over his windshield as he was attempting to clear a ridge near the Dome and begin his descent toward Knoxville. His aircraft crashed into trees about 50 feet short of the ridge top.

Fortunately for the pilot, his *Tri-Pacer* hit at an oblique angle and the trees absorbed enough of the impact for him to survive without serious injury. His ELT functioned, but the efforts of the Civil Air Patrol to locate the downed plane were hampered by the increasingly severe icing conditions, and the pilot was forced to spend the night in the wreckage, enduring below freezing temperatures and severe winds. Encouraged and aided by radio contact through the night with the FAA control tower at Knoxville, the pilot survived, and was rescued the following morning by Army helicopters.

Even local pilots in this region who know the terrain well are occasionally victimized by the weather, especially if they are in the

Clear skies overhead in the valley, but watch out for the cumulous build up over the ridges.


LAKE HURON
LAKE ONTARIO
LAKE ERIE
HARRISBURG
FRONT ROYAL
CUMBERLAND GAP
ASHEVILLE
2
3
5
4
Causes of Accidents
WEATHER
ENGINE FAILURE
OTHER
The Appalachian Range
NORTHERN MTNS.
WESTERN PLATEAU
VALLEY & RIDGE
SMOKEY MTNS.
BLUE RIDGE MTNS.

habit of using illegal and unsafe techniques for flying in IFR weather without benefit of approved instrument procedures. For example, the practice of homing in on commercial radio stations with the ADF when the ground is partially or wholly obscured can hardly be recommended on a regular basis.

On the day before Christmas, 1977, the fixed base operator from Bryson City, N.C., just south of Great Smokey Mountain National Park, completed a 150 mile charter flight in a Cessna *Stationair* to Charlotte, N.C. by way of Asheville. He picked up his passenger and took off for the return flight at noon, filing IFR for Asheville. The 1:16 weather observation for Asheville given the pilot was, 1,200′ scattered, measured ceiling 4,300′ broken, visibility 12 miles.

Approaching Asheville the pilot advised the tower he was cancelling his IFR flight plan and would continue on to Bryson City by way of Waynesville, Balsam and Sylva, a total distance of approximately 50 miles. The pilot indicated he had the highway, Interstate 40, in clear view as far as Waynesville, and from that point he would continue along narrow, twisting Scott Creek Valley.

At 1:28 the tower advised, 'I'm sure you can see those peaks are obscured by clouds." At 1:31, flying over Balsam, about half way between Asheville and Bryson City, the pilot reported to the tower that everything was "looking good." He asked for and received an altimeter setting—and was informed that radar contact had been lost. This was the last transmission received.

At approximately 1:35 p.m. the aircraft was sighted by persons on the ground six miles east of Sylva, flying 100-200 feet above the ground in extremely restricted visibility. The aircraft disappeared almost immediately, and very soon afterwards the sounds of impact were heard. The wreckage was located on the ridgeline of Plott Mountain at the 5,000′ level, five miles northeast of Sylva. The low frequency receiver of the aircraft was tuned to 680 mhz, the frequency of radio station WRGC at Sylva. According to the National Transportation Safety Board investigation, the pilot was known to be in the habit of using the signal from the station's antenna, located in Sylva, to find his way over the town and on down the valley towards Bryson City. However, the station had recently installed a second antenna on the mountain top east of Sylva, for daytime use; and apparently the pilot was unaware of this fact, or had forgotten about it, when he made his unfortunate decision to proceed despite the extremely bad flying conditions. He and his passenger did not survive the crash.

Numerous accidents which have taken place in and around the Asheville Basin have been ascribed to "power loss" by the pilot, when in fact the engine and aircraft operated normally for the conditions of flight. Subsequent investigations have shown that the pilots were unaware of the intensity of local turbulence in these mountains, especially when the winds aloft are at high velocity. But the Southern Appalachians are well known to glider enthusiasts because of the consistantly strong "mountain wave" produced by wind currents flowing over them. To gain some idea of the strength of this ridge lift, consider the achievements of the celebrated "Appalachian ridge runner," Karl Striedeck, holder of the world's record for endurance gliding. On May 9, 1977, Karl soared from Lock Haven Airport in Pennsylvania to Oak Ridge, Tenn., and back, a distance of 1,015.8 miles, in 14 hours and 3 minutes—nonstop! Mt. Mitchell, incidentally, is a favorite area for glider pilots seeking altitude records.

Looking Glass Mountain, in the Pisgah Range near Asheville, frequently obscured by clouds.

Ridge lift always has its counterpart in correspondingly strong downdrafts, and pilots who are not used to playing tag with the wind in motorless aircraft are ill-advised to fly at low altitudes in the Appalachians, or to attempt to overfly the terrain with minimal clearance. The danger is greatest in poor weather, when clouds or fog may obscure possible escape routes for the airman caught in an unexpected downdraft. But accidents have also occurred when aircraft were well clear of clouds and were crossing over ridges at what was believed to be a sufficiently high altitude.

The accident near Mt. Mitchell mentioned earlier is a typical example of how important it is to pilots to plan their altitude for crossing these mountains in accordance with local conditions. Wind velocities of over 100 miles per hour have been recorded on top of Mt. Mitchell, and at such times experienced local pilots will give the mountain a wide berth, or select a crossing altitude a good 5,000 feet above the peak. Mt. Mitchell is not a solitary peak, but rises at the southern end of a solid ten mile knife-edge ridge of mountains, all over 6,500 feet high.

Not only does this produce severe downdrafts on the lee side, but it also frequently results in a strong flow of air around the northern end of the ridge, which plays havoc with altimeter readings. These winds have a Venturi effect, whereby velocity is abruptly increased and air pressure decreased. Under these conditions the aircraft altimeter may read as much as 1,000 feet higher than the actual altitude of the aircraft!

Mt. Mitchell, incidently has long been known as a mountain of bad omens and ill fortune. The explorer for whom it was named, Dr. Elisha Mitchell, himself died in a fall down one of its precipitous slopes.

Another problem that troubles pilots unfamiliar with these mountains is the absence of recognizable terrain features, especially at night or when the light level is down. Much of the Blue Ridge Mountains, for example, are National Park or National Forest land, with few habitations. The pilot whose aircraft is too low for radio voice contact or signal reception can get lost very easily; and locating downed aircraft in this heavily forested region can be difficult. Some aircraft have completely disappeared; others have been located by chance years after they crashed, by hikers or hunters.

In sum, the southern Appalachians are a great place to visit, but no place for casual flying or scud running. If you are in transit, plan to cross at an altitude at least one and a half times the elevation of the highest peak, in normal weather; when the winds are strong, make that at least twice the elevation. If this will put you into clouds and you are not IFR qualified, you are advised to fly around the mountains rather than take a chance on slipping under the clouds or some through hoped for opening. It may cost you some time, but it could also save your life.

This article was prepared with the assistance of FAA's Southern Region, especially the District Office at Charlotte and the Asheville control tower. A later article will discuss in detail flying in the northern Appalachians.

TRIM TALK

Why You Need to Know About Reverse Control

". . . your January/February issue had an interesting article ("Elevator Jam") about a pilot with a jammed elevator control, and the struggle she had to get the nose-down to land. Didn't the lady in question make a mistake using nose-down trim? I've always believed that when the elevator is jammed the trim control works in reverse."

The article provoked many comments of this kind. The "lady in question" was, indeed, aware of the reverse command effect of trim controls on modern aircraft, but pilot Mary Barr (remember, she is a certified A & P mechanic) also knew that in many of the older aircraft, like the venerable Cessna 180 "Blue Goose" she was flying at the time, horizontal trim utilizes the *stabilizer* rather than a tab on the elevator, and therefore trimming nose-down would help lower the nose. And it did.

The subject of trim is an interesting one, and evidently needs clarification, since some of the reader/pilots who wrote in apparently did not realize that not all aircraft are trimmed by means of elevator tabs.

To begin with, what is trim, and how does it work on an aircraft? Trim, in the ordinary usage, is a means of adjusting control surfaces, such as the elevator, rudder, or aileron, so as to require the least amount of hand or foot pressure to keep the aircraft in a desired attitude. For example, on takeoff, some nose-high trim makes it easier for the pilot to hold the desired pitch altitude for take off and climb. At level cruise, proper trim (in coordination with appropriate power setting) makes it possible for the aircraft to almost fly itself.

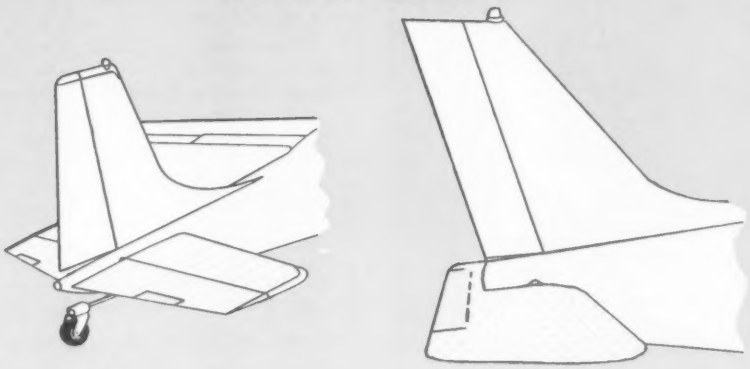
How is this accomplished? Trim systems can be as ultra simple as a rubber band or spring between the panel, the stick and the seat; and as sophisticated as electro/hydraulic devices that eliminate any sense of pressure or feel. On most contemporary light aircraft built since 1954, with a conventional horizontal stabilizer and elevator, the trim control mechanism manually moves a small section (called a trim tab) of the elevator (or rudder or aileron, when these are trimmable) out of alignment with the control surface. Putting in nose-up trim, for example (Figure 2), moves the elevator tab *down* and holds it in place. Airflow, pushing against the depressed tab, causes the elevator to move in the opposite direction which in turn has the effect of lowering the aircraft's tail and raising the nose. Vice versa for nose-down trim (Figure 3) and similarly for the other flight controls.

In place of the conventional horizontal stabilizer and elevator, some Piper's and several other aircraft use a "stabilator" (see Figure 1). There is no elevator; the entire horizontal tail section pivots in response to fore and aft wheel pressure. Trim is accomplished by means of a narrow movable section at the aft end of the stabilator, which functions similarly to the tabs of the elevator on other aircraft. *As far as the pilot is concerned*, trimming with a stabilator is identical to trimming with the more conventional horizontal stabilizer/elevator type of control.

In addition to easing the pressure which the pilot must maintain on the controls, trim mechanisms are very useful in the event of inflight primary control failure. For example, if the linkage between the cockpit and the elevator fails in flight, leaving the elevator free to weathervane in the wind, the trim tab can be used to raise or lower the elevator, within limits. The trim tabs are not as effective as normal linkage control in some conditions (such as low air speed), but they do have some positive effect—usually enough to help bring about a safe landing.

On the other hand, if the elevator itself becomes jammed, because of forgotten gust locks, blocked linkage, or for whatever reason, the aerodynamic effect of activating

Figure 1
TWO COMMON TYPES OF HORIZONTAL CONTROL SURFACES



CONVENTIONAL STABILATOR

Figure 2
NOSE UP TRIM

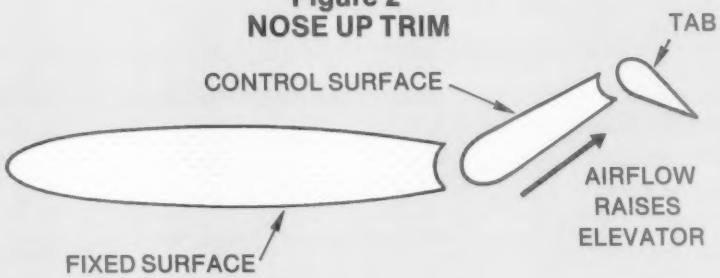


Figure 3
NOSE DOWN TRIM

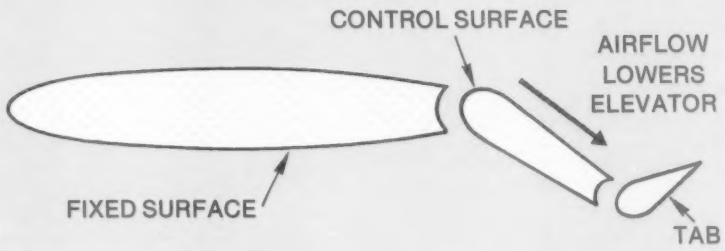
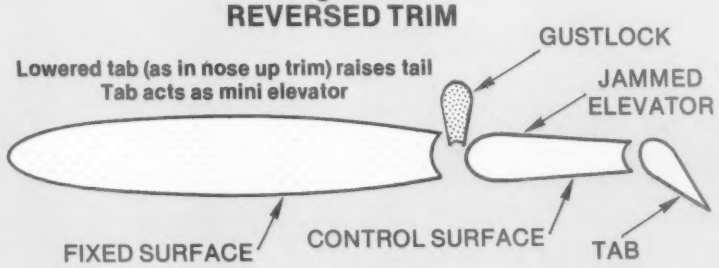


Figure 4
REVERSED TRIM



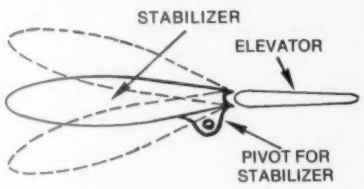
trim tabs is *reversed*. Nose-down trim normally involves elevating the tabs (which lets the wind push the elevator down and the tail up) but if the elevator is jammed and cannot go down, air pressure on the upraised tabs will actually push the entire tail down—and the nose *up* (Figure 4). In such cases, to get the nose down, you apply reverse trim—nose up trim. This lowers the tab, and air pressure then raises the tail. Any flight control which is moved aerodynamically will have this reverse effect if the control surface itself is jammed.

However, many aircraft built before 1954 (such as Mary Barr's "Blue Goose") do not use tabs on the primary control surface as trimming devices. They rely instead on a mechanism which raises or lowers the leading edge of the horizontal stabilizer (see Figure 5). Such devices are not affected by jammed elevators—in other words, the trim control functions normally (never in reverse) as long as it is usable. Some homebuilt aircraft may also employ this type of trim.

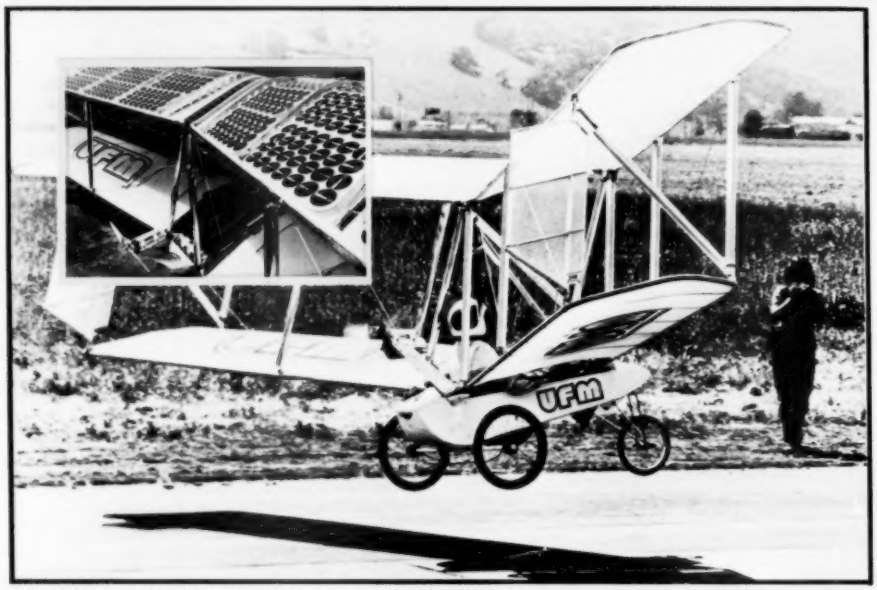
When controls become inoperable in flight —a rather rare occurrence—the pilot must determine quickly whether the control surface is actually jammed, or whether it is simply not responding to cockpit control. He may then be able to initiate some degree of control by appropriate use of trim. The time to learn about how trim functions in the airplane you fly is now, on the ground, not during an emergency.

Use everything you have. You may need it all. ■

Figure 5
Alternate Methods of Trim



A *movable stabilizer,* installed on J-3 Cubs, Cessna 180s built before 1954, and certain other older aircraft, does not use a tab. The cockpit trim wheel activates a jackscrew which moves the leading edge of the stabilizer up or down. Consequently if the elevator linkage is inoperative, or the elevator is jammed, the trim mechanism is still effective. Note that it will always function positively —never with reverse effect.



SUNPOWER OR MOONSHINE? Name your pleasure. If avgas becomes scarce or overly expensive, pilots in the near future may be able to take their choice between an aircraft driven by a solar-battery-powered electric motor or by a combustion engine burning pure alcohol produced from a solar still. Larry Mauro, in sunny California, has invented an "Ultralight Flying Machine" which has made the first known flight using solar power and he soon expects to be flying high on "white lightning."

VOLUNTARY PROFICIENCY PROGRAM LAUNCHED FOR PILOTS

FAA has approved a new program for general aviation pilots which for the first time will provide a standard of recurrent training designed to maintain flying skills at a high level of proficiency and safety. The program, which began on July 15, 1979, and will be administered by Accident Prevention Specialists at FAA Flight Standards District Offices, is voluntary.

While all pilots are presently required to obtain a flight review with an appropriately rated flight instructor once every two years, in order to act as pilot in command, this Biennial Review does not specify maneuvers to be flown or minimum flight time.

The voluntary Pilot Proficiency Program will focus on flight maneuvers which have been identified as most likely to lead to accidents. Recurrent flight training for airplane pilots will include one hour of basic aircraft control (stalls, turns, and a variety of maneuvers), one hour of precision approaches and takeoffs and landings (normal, crosswind, soft field and short field); and one hour of instrument training. Pilots must complete the program within 120 days. A training profile for helicopters and gliders has also been established.

The program is open to all persons holding a private pilot certificate or higher. The flight training may be given by any flight instructor, who will endorse the applicants logbook appropriately. Participants in the program must also attend at least one aviation-related safety meeting, seminar, or clinic conducted or approved by the local FAA accident prevention specialist.

Pilots who complete the proficiency program will be awarded a distinctive winged tie-clasp or lapel pin. Provisions have been made for follow-up recurrent training.

For further details contact your nearest flight instructor, accident prevention counselor, or FAA Flight Standards District Office. An advisory circular, AC 61-91, is available from the DOT/FAA Distribution Unit, M-443-1, Washington, D.C. 20590.

RECENT ADVISORY PUBLICATIONS

AC 65-19B, "Inspection Authorization Study Guide." Explains the qualifications for Inspection Authorization, the rating which allows certificated mechanics to approve major repairs and major alterations, conduct annual inspections and perform or supervise progressive inspections in accordance with Federal Aviation Regulation Part 43. Also helps prepare applicant for required written test. Price: $1.50 stock number 050-007-00447-8.

AC 147-2T, "Directory of FAA Certificated Aviation Maintenance Technician Schools." Free.

AC 183-32, "FAA Designated Maintenance Technician Examiner Directory," lists Designated Mechanic and Parachute Rigger Examiners. Free

AC 140-7, "FAA Certificated Maintenance Agencies Directory," lists FAA certificated Repair Stations and Parachute Lofts. Free.

To purchase advisory circulars, send check or money order payable to the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402.

Free advisory circulars are available from the DOT Publications Section, M-443.1, Washington, DC 20590.

FAA has released a list of 122 recent related reports, which are sold by the National Technical Information Service. Subjects include aircraft safety, airports, air-traffic control, approach and landing systems, aviation medicine, communications, environment, frequency management, wind shear, wake vortices, etc. Copies of the list may be obtained from the Service, at 5285 Port Royal Rd., Springfield, Va. 22161.

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• Lightning Protection

I am writing in regard to your article in the September 1978 issue of *General Aviation News*, "A Stroke of Light." As I read the article I realized how dangerous lightning is. After completing the article I had three questions about lightning and its prevention:

1) Can some type of lightning rod or wiring be set up so no damage to the plane will result?

2) What class and type of airplanes are built today that are designed to absorb lightning?

3) Why does lightning leave the plane after entering the plane?

I would appreciate any other information about lightning and ways to combat its effects.

Frederic W. Lica
Plantation, Fla.

Question 1 and 2 can be answered at the same time. In modern aircraft "static wicks," especially designed for each make and model, are attached to various points on the airfoils, primarily to discharge buildups of static electricity that could interfere with radio reception. These also can serve as escape points for lightning, which usually leaves an aircraft at some slender, metallic extremity. The shape and length of the wick depends upon such factors as the sophistication and speed of the aircraft. Also, special care is taken to bond all metal joints and connections in such a manner as to assure unimpeded passage of lightning. For homebuilts and older aircraft where such protection was not required by the type certificate, bonding can be inspected and static wicks can be installed by a certificated airframe mechanic.

Aircraft are hit by lightning (more likely in IFR flight) essentially because they happen to be in a position to intercept a bolt that is passing from one cloud to another or to the ground. Lightning leaves the aircraft because it is seeking a target of strong opposite electrical potential; and the less resistance which the aircraft offers to its passage, the less damage will be done.

A definitive book on this subject, "Lightning Protection of Aircraft," written for NASA by Fisher and Plummer, is sold by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20403. It is also available in some libraries.

• Reliever Airport

Pilots who may be flying over the San Joaquin Valley of central California might want to know about the existence of Synanon Airport. Located at the 3,100′ elevation at Badger, Cal. (41.2 DME miles from Fresno on the 095° radial, or 38 DME miles from Visalia on the 040° radial), it is high enough to be above the fog and low clouds which often place those such airports below IFR minimums. Upon request Fresno Approach Control will vector aircraft to Synanon Airport where they can wait for the fog to lift in our pilots lounge. Note that presently we have no lights, and no fuel.

Dan Sorkin
Badger, Cal.

• "Neiner?" Not Hardly

From "Radio Response" (Nov./Dec. 1978) comes the challenge, "Why else would intelligent adults say 'niner' for 'nine' except to keep it from being confused with 'five'?"

I thought it had to do with helping our fellow aviators who speak German to avoid confusion with their word for "no" ("nein")—English being the international language of air traffic control.

Stanley C. Gardiner
Costa Mesa, Calif.

• Fire Safety

I have a suggestion for aircraft safety.

I think the initiation of requirements for automatic fire retardant in the cabin area, and pre-crash fuel jettison should be investigated. It might be one way general aviation could have fewer fatalities. Not to mention what it could do for the airlines.

I would like to know the current standing of this problem!

Dan Ducolon
Anchorage, AK.

FAA has carried out a number of tests on cabin fire extinguishing systems, for the purpose of assessing the potential safety benefits. These tests have shown that while there are advantages to the systems, there are also certain disadvantages, such as weight and possible toxic effects of extinguishing agents. Considering the pros and cons at this time, we do not believe that installation of these systems should be made mandatory.

Regarding the use of fuel jettison systems, service history has shown that accidents with small airplanes generally occur suddenly, without sufficient warning to allow the pilot an opportunity to jettison fuel safely. Fuel jettison systems are used on large multi-engine transports, where the crew has sufficient time to jettison fuel at a rate which will not raise the likelihood of ignition. We appreciate the suggestion. Thank you.

• Hooded Time

I enjoyed your article "Logging Time" in the Mar/Apr 79 issue. However, the answer to my particular question was not there.

Consider a private pilot on an instrument practice flight (hood) in VFR conditions using another private pilot (not an instructor) as a safety pilot, as is permitted by the FAR's. It would seem that since the hooded manipulator of the controls cannot be responsible for collision avoidance in a VFR environment he could not be considered as the PIC. On the other hand, the safety pilot does not meet the requirement of "sole manipulator of the controls" and is not a CFI.

Duane A. Bowen
Highland, Ind.

A private pilot wearing a hood and conducting a practice IFR approach with another appropriately rated pilot as safety pilot is permitted to log the time as PIC. The two pilots should agree on who would function as PIC before the flight. The safety pilot could log either PIC or second-in-command.

• VORTAC's as Visual Aids

A suggestion which you could try out at several field sites where orientation is a frequent problem for VFR pilots:

Add, at each of the 16 compass points around the top rim of the VORTAC dish, a small white strobe light, fired sequentially, as in the Sequenced Flashing Light Systems, several times per minute. Mark the North light blue or red. This would make the VORTAC helpful as a navigation and safety aid both day and night, visually as well as instrumentally.

Additionally, place an amber light beacon in a Fresnel-lens housing at the top of the antenna cone, to be actuated with the VOR identifier code for positive visual identification.

Philip Whittlesey, M.D.
Baltimore, Md.

We will be glad to pass the suggestion on to Flight Standards Service and Airway Facilities Service.

FAA GENERAL AVIATION NEWS welcomes comments from our readers. No anonymous letters will be used, but names will be withheld on request. Address: FAA GENERAL AVIATION NEWS, AFS-807, Washington, D.C. 20591.

• He May Need a Ladder

Shortly after reading the item, "Bomb Sniffing Gerbils Tested," in the October 1978 issue of General Aviation News, I checked the dictionary for a description of gerbil, and then went to the drawing board. The idea did have certain comic overtones, no doubt, but the results of my rendering are quite literal.

After these efforts I'm convinced no one will have any difficulty recognizing an airport policeman in the act of "thwarting terrorists," but we hope that the gerbil can reach the bomb once he's sniffed it.

William R. Morrison
Worcester, Mass.

INSTRUMENT CORNER

• Holding With a DME

When holding over a VORTAC at 10,000 feet with a two-mile DME indication at station passage and ten-mile holding legs approved, what would the correct procedure be? To hold between the two DME (which would be over the station) and the 12-mile fix? Or would the correct procedure be to hold from station passage to the ten-mile fix (which would be an eight-mile leg)?

Ruth Dobrescu
Glen Cove, N. Y.

Neither. DME miles should not be used to establish leg lengths when holding over a VORTAC, because DME indications are erratic directly over the station. When DME holding patterns are issued by ATC, the DME fixes are far enough away from the station to avoid this "cone of confusion", which widens with altitude. When holding over a VORTAC, legs should be timed in the conventional manner. Furthermore, it is not advisable for pilots to use DME indications to determine VORTAC station passage. The "to-from" flag should be used instead.

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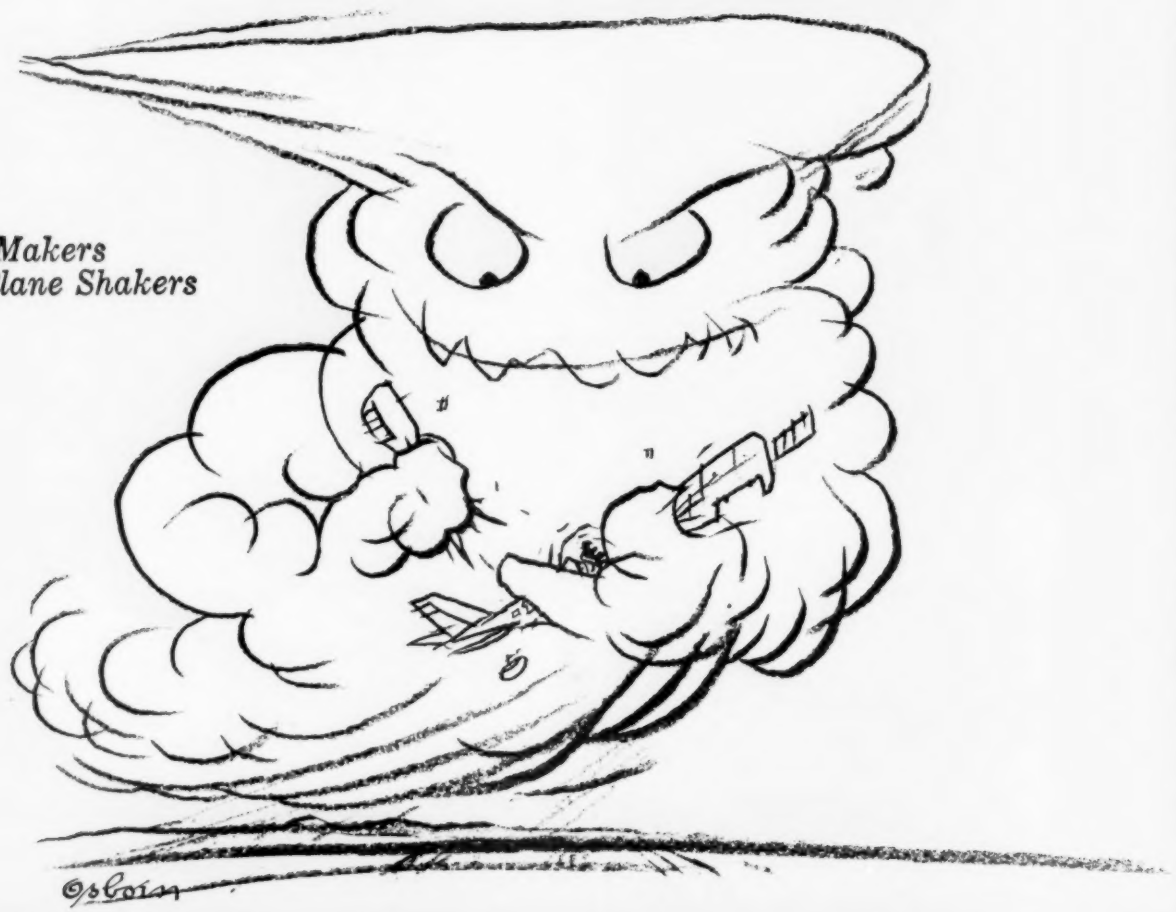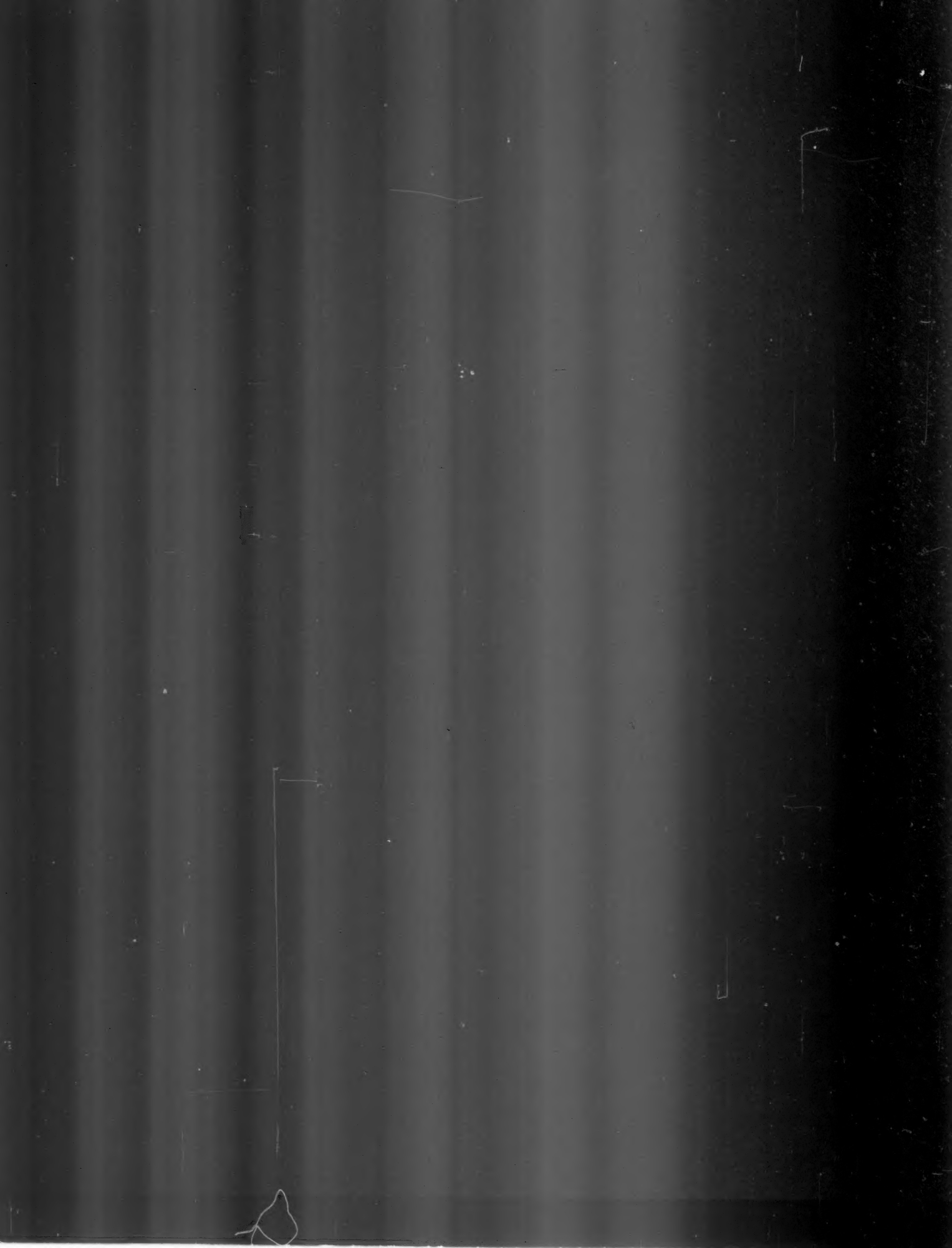
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